

What is claimed is:

1. A method for direct image pick-up of a particular granular speck pattern generated by reflecting light of a laser beam depending on a degree of roughness of the surface of an object to be inspected, said method comprising the steps of:

irradiating said object to be inspected with the laser beam;

directly picking up said granular speck pattern in a relatively well lighted environment using a lensless video camera having a CCD (Charge Coupled Device) element incorporated in said video camera; and

providing a shielding tube coupled to said camera to shield extraneous light rays.

2. Apparatus for direct image pick-up of a particular granular speck pattern generated by reflecting light of a laser beam depending on a degree of roughness of the laser beam irradiated surface of an object to be inspected, said apparatus comprising:

a lensless video camera having a CCD element incorporated in said video camera; and

a shielding tube coupled to said camera for shielding extraneous light rays.

3. A method for direct image pick-up of a particular granular speck pattern generated by the transmitted light of a laser beam diffusively reflecting depending on a degree of roughness of the laser beam irradiated onto the surface of an object to be inspected or shapes of fine ingredients constituting said object to be inspected, said method comprising the steps of:

irradiating said object to be inspected with the laser beam;

directly picking up said granular speck pattern in a relatively well lighted environment using a lensless video camera having a CCD element incorporated in said video camera; and

a shielding tube coupled to said camera to shield extraneous light rays.

4. Apparatus for direct image pick-up of a particular granular speck pattern generated by transmitted light of a laser beam diffusively reflecting depending on a degree of roughness of the laser beam irradiated surface of an object to be inspected or on shapes of fine ingredients constituting said object to be inspected, said apparatus comprising:

a commercially available video camera having a CCD image detector and deprived of its image forming lens; and

a shielding tube coupled to said camera to shield extraneous light rays from striking the CCD of said camera.

5. Apparatus for direct image pick-up of a particular granular speck pattern comprising:
a laser for directing a laser beam onto the surface of an object to be inspected;
a digital camera having a CCD element incorporated in said camera; and
a shielding tube coupled to said camera for shielding extraneous light rays.

6. A method for direct image pick-up of a particular granular speck pattern generated by the transmitted light of a laser beam diffusively reflecting depending on a degree of roughness of the laser beam irradiated onto the surface of an object to be inspected or shapes of fine ingredients constituting said object to be inspected, said method comprising the steps of:

irradiating said object to be inspected with a laser beam;

directly picking up said granular speck pattern in a relatively well lighted environment using a lensless digital camera having a CCD element incorporated in said camera; and

a shielding tube coupled to said camera to shield extraneous light rays.

7. Apparatus for direct image pick-up of a particular granular speck pattern generated by transmitted light of a laser beam diffusively reflecting depending on a degree of roughness of the laser beam irradiated surface of an object to be inspected or on shapes of fine ingredients constituting said object to be inspected, said apparatus comprising:

a lensless video camera having a CCD image detector for receiving light directly onto said CCD; and

a shielding tube coupled to said camera to shield extraneous light rays from striking the CCD of said camera.

8. The method of claim 1; further including:
moving the object;

measuring an amount which the object has moved;
calculating the amount of movement on the basis of movement of the granular speck pattern with respect to an index of the granular speck pattern; and
displaying a result of the calculation as a numerical value of the measured amount of movement.

9. The apparatus of claim 2, further including:

an A/D converter coupled to said camera to convert an analog signal supplied from said camera to a digital signal;

a processing unit coupled to the A/D converter to calculate an amount of movement of said object on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said camera and represented by said A/D converted signal; and

a display coupled to said processing unit to display the amount of movement calculated by said processing unit.

10. The apparatus of claim 4, further including:

an electrical circuit coupled to said camera for calculating the amount of movement of said object on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said camera and displaying the amount of movement calculated by said electrical circuit.

11. The method of claim 3, further including:

detecting a granular speck pattern generated by the reflecting laser beam as an index;
calculating an amount of movement of the object on the basis of movement of the granular speck pattern with respect to said index; and

displaying a result of the calculation as a numerical value of the measured amount of movement.

12. The apparatus of claim 5, further including:

a processing unit coupled to said camera to calculate the amount of movement of the object on the basis of movement of a granular speck in said granular speck pattern with respect to a pixel interval of said granular speck pattern detected by said camera; and

a display coupled to said processing unit to display the amount of movement calculated by said processing unit.

13. The apparatus of claim 7, further including:

an electrical circuit coupled to said camera for calculating the amount of movement of the object on the basis of movement of the granular speck in said pattern with respect to a pixel interval of said granular speck pattern picked up by said camera and displaying the amount of movement calculated by said electrical circuit.